

DES MOINES RIVER AT OTTUMWA, IOWA

LETTER FROM THE SECRETARY OF THE ARMY TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY, DATED DECEMBER 7, 1970, SUBMITTING A REPORT, TOGETHER WITH ACCOMPANYING PAPERS AND AN ILLUSTRATION, ON DES MOINES RIVER AT OTTUMWA, IOWA, REQUESTED BY A RESOLUTION OF THE COMMITTEE ON PUBLIC WORKS, HOUSE OF REPRESENTATIVES, ADOPTED OCTOBER 5, 1966



APRIL 11, 1972.—Referred to the Committee on Public Works
and ordered to be printed with an illustration

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1972

THE HISTORY OF THE UNITED STATES

1776

1777

1778

1779

A full and complete history of the United States, from the first settlement of the colonies to the present time. This work is the result of many years of research and study, and is the most comprehensive and accurate history of the United States ever published. It contains a full and complete account of all the events, persons, and places which have shaped the history of the United States, and is a valuable work for all who are interested in the history of the United States.

THE HISTORY OF THE UNITED STATES

THE HISTORY OF THE UNITED STATES

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ILLUSTRATION ACCOMPANYING THE REPORT OF THE DISTRICT ENGINEER
(Only Plate 1 printed)

Plate:

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LETTER OF TRANSMITTAL

DEPARTMENT OF THE ARMY

WASHINGTON, D.C. 20310



Honorable Carl Albert
Speaker of the House of Representatives
Washington, D. C. 20515

March 16, 1972

Dear Mr. Speaker:

I am transmitting herewith a favorable report dated 7 December 1970, from the Chief of Engineers, Department of the Army, together with accompanying papers and an illustration, on Des Moines River at Ottumwa, Iowa, requested by a resolution of the Committee on Public Works, House of Representatives, adopted 5 October 1966.

The views of the State of Iowa and the Departments of the Interior, Agriculture, Transportation, and Health, Education, and Welfare are set forth in the inclosed communications.

Copies of the environmental statement required by Section 102(2)(C) of the National Environmental Policy Act of 1969 were sent to the Chairmen of the House and Senate Public Works Committees and the Council on Environmental Quality on 13 November 1970.

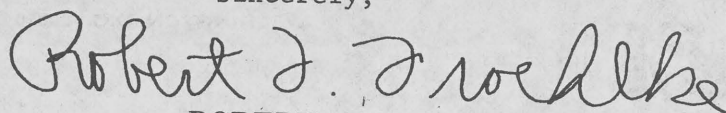
Since this project meets all the requirements of Section 201 of the Flood Control Act of 1965 and involves little or no controversy, I recommend that the project be approved for appropriations.

Subsequent to preparation of the report of the Chief of Engineers, a new interest rate has been adopted for discounting future benefits and computing costs. Use of the prescribed rate of 5-3/8 percent would result in no appreciable change in the benefit-cost ratio.

The Office of Management and Budget advises that there is no objection to the submission of the proposed report to the Congress; however, it states that no commitment can be made at this time as to when any estimate of appropriation would be submitted for construction of the project, if approved for appropriations, since this would be governed by the President's budgetary objectives as determined by the then prevailing

fiscal situation. A copy of the letter from the Office of Management and Budget is inclosed as part of the report.

Sincerely,



ROBERT F. FROEHLKE

Secretary of the Army

1 Incl
As stated

COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

6 March 1972

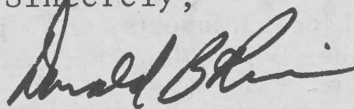
Honorable Robert F. Froehlke
Secretary of the Army
Washington, D. C. 20310

Dear Mr. Secretary:

Mr. Robert E. Jordan's letter of March 11, 1971, submitted the favorable report of the Chief of Engineers on Des Moines River at Ottumwa, Iowa.

You are advised that there would be no objection to the submission of the proposed report to the Congress. No commitment, however, can be made at this time as to when any estimate of appropriation would be submitted for construction of the project, if approved for appropriations, since this would be governed by the President's budgetary objectives as determined by the then prevailing fiscal situation.

Sincerely,



Donald B. Rice
Assistant Director



Natural Resources Council

Grimes State Office Building
East 14th and Grand
Des Moines, Iowa 50319

OTHIE R. McMURRY, Director
R. G. BULLARD, Water Commissioner

December 1, 1970

F. J. Clarke
Lieutenant General
Chief of Engineers
Department of the Army
Washington, D. C. 20314

Re: ENGCW-PD, Review Survey Report, Des Moines River,
Ottumwa, Iowa

Dear General Clarke:

The Iowa Natural Resources Council, acting under the authority provided in Chapter 455A of the Code of Iowa, as amended, and by designation of the Governor of Iowa, submits the following comments for the State of Iowa on the "Review Survey Report For Flood Control, Des Moines River at Ottumwa, Iowa," as submitted to this office September 17, 1970, in accordance with Public Law 78-534 and Public Law 85-624.

These comments are based on the knowledge of the Iowa Natural Resources Council, review of the subject project, discussions with interested State departments and local interests, and a public hearing held at Ottumwa, Iowa, on November 20, 1970. The Iowa Natural Resources Council finds:

- 1) that the City of Ottumwa, Iowa, does experience flooding of basements in the City's north side main business district when an interceptor sewer system is overtaxed from heavy local runoff;
- 2) the condition is severe during high stages on the Des Moines River; and
- 3) the proposed improvement will alleviate the problem and compliment the City's flood protection works.

COUNCIL MEMBERS:

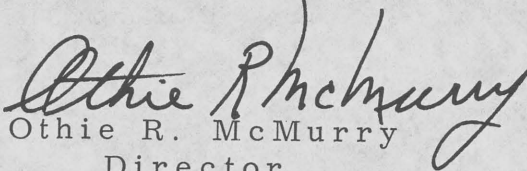
STANLEY L. HAYNES, Chairman
Mason City
L. GUY YOUNG, Vice-Chairman
Bedford
CLIFFORD M. NASER, Secretary
Ft. Dodge

J. W. HOWE
Iowa City
MRS. MABEL MILLER
Keosauqua
WILLIAM C. MURRAY
Ames

J. JUSTIN RODGERS
Spirit Lake
HUGH TEMPLETON
Knoxville
SAMUEL J. TUTHILL
Iowa City

As a consequence of these findings, the Resources Council concurs in the views expressed in your Report and urges you to submit this project for Congressional action.

FOR THE IOWA NATURAL RESOURCES COUNCIL


Othie R. McMurry
Director

ORM/dhh/jrd

COMMENTS OF THE DEPARTMENT OF THE INTERIOR



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

19 November 1970

Dear General Clarke:

This responds to your letter of September 17, 1970, asking for our comments on your proposed report for Des Moines River at Ottumwa, Iowa, and Colonel Newman's letter of October 10, 1970, submitting for our comments the draft environmental statement for the same project.


We have reviewed the proposed report and draft statement and in general concur with your recommendations. We offer the following comments for your information and use.

We find that no recreation development is proposed and that there are no significant opportunities for such development within the scope of the project. However, the proposed plan would permit untreated sewage to be discharged into the Des Moines River during periods of heavy surface runoff, a continuation of the current situation. The Des Moines River at this point has been designated by the State of Iowa for body contact recreation use.

We believe that paragraph 1, Project Description, in the draft environmental statement should be expanded to mention that untreated sewage is expected to pass through the improved sewer at times into the Des Moines River and that the proposed plan is only an interim solution to the problem of combined sanitary and storm sewer overflows.

We appreciate the opportunity of presenting our views.

Sincerely yours,


Deputy Assistant Secretary of the Interior

Lt. Gen. F. J. Clarke
Chief of Engineers
Attn: ENGCW-PD
Department of the Army
Washington, D.C. 20314

COMMENTS OF THE DEPARTMENT OF AGRICULTURE



DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

November 3, 1970

Honorable Stanley R. Resor
Secretary of the Army

Dear Mr. Secretary:

This is in reply to the Chief of Engineers' letter of September 17, 1970, transmitting for our review and comment his proposed report and pertinent papers on Des Moines River at Ottumwa, Iowa.

The proposed plan of improvement would reduce damages caused by flooding in Ottumwa by improving the discharge efficiency of an interceptor sewer by providing additional gated openings in the sewer.

Forest resources would not be affected adversely by the project, nor would the project offer feasible opportunities for enhancement of forest land.

The proposed works of improvement would have no adverse or beneficial effects on existing or expected project activities of this Department.

We appreciate the opportunity to review and comment on this report.

Sincerely,

A handwritten signature in dark ink, appearing to read "T. K. Cowden", is written over the typed name.

T. K. COWDEN
Assistant Secretary

COMMENTS OF THE DEPARTMENT OF TRANSPORTATION



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDANT (AWL)
U.S. COAST GUARD
WASHINGTON, D.C.
20591

24 September 1970

Lt. General F. J. Clarke
Chief of Engineers
Department of the Army
Washington, D. C. 20314

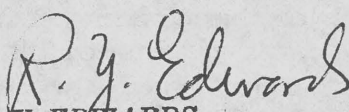
Dear General Clarke:

This is in response to your letter of 17 September 1970 addressed to Secretary Volpe concerning Des Moines River at Ottumwa, Iowa.

The concerned operating administrations of the Department of Transportation have reviewed your proposed report and other pertinent papers. Since this project is primarily a flood program and its effect upon transportation is insignificant, no comment is made.

The opportunity afforded this Department to review and comment on your proposed project is appreciated.

Sincerely,


R. Y. EDWARDS
Rear Admiral, U. S. Coast Guard
Chief, Office of Public and International Affairs

COMMENTS OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY

WASHINGTON, D.C. 20201

November 12, 1970

Lt. General F. J. Clarke, USA
Chief of Engineers
U.S. Corps of Engineers
Department of the Army
Washington, D.C. 20315

Dear General Clarke:

As requested in your letter of September 17, 1970, the report on the Des Moines River at Ottumwa, Iowa, has been reviewed by appropriate agencies of the Department that have an environmental interest.

The report describes a local flood protection project for the city of Ottumwa. The project provides for the construction of additional outlets for the city's interceptor sewer.

Combined sewer overflows cause basement and street flooding in the community, and significant public health benefits will accrue with the elimination of this condition. As noted by the Federal Water Quality Administration in a letter of May 25, 1970, the overflow structures should be considered as an interim measure to relieve flooding pending a solution to the pollution problems of the city's combined sewer system.

The Department of Health, Education, and Welfare has no objection to the authorization of this project insofar as Departmental interests and responsibilities are concerned.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "Roger O. Egeberg", is written over the typed name and title.

Roger O. Egeberg M.D.

Assistant Secretary

for Health and Scientific Affairs



DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

OFFICE OF THE ASSISTANT SECRETARY FOR PUBLIC AFFAIRS

WASHINGTON, D.C. 20462

February 1, 1973

Mr. J. Edgar Hoover
Director, Federal Bureau of Investigation
U.S. Department of Justice
Washington, D.C. 20535

Dear Mr. Hoover:

I am pleased to inform you that the Department of Health, Education and Welfare has received your letter of January 17, 1973, regarding the proposed regulation concerning the use of certain drugs in the treatment of certain conditions.

The Department is currently reviewing the proposed regulation and will be in a position to provide you with a response in the near future. The proposed regulation is being reviewed in light of the Department's ongoing efforts to ensure the safety and effectiveness of certain drugs.

During the review process, the Department will be consulting with the appropriate regulatory agencies and the public. We will also be conducting a thorough analysis of the proposed regulation to ensure that it meets the Department's standards for safety and effectiveness. We appreciate your interest in this matter and will keep you informed of any developments.

I am sure that you will understand the need for a thorough review of this proposed regulation. We will be in touch with you again once a final decision has been reached.

Sincerely,

[Signature]
Assistant Secretary for Public Affairs
U.S. Department of Health, Education and Welfare

DES MOINES RIVER AT OTTUMWA, IOWA

REPORT OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY



DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS WASHINGTON, D.C. 20314

IN REPLY REFER TO

ENG CW-PD

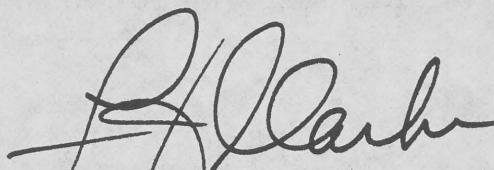
7 December 1970

SUBJECT: Des Moines River at Ottumwa, Iowa

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress the report of the Board of Engineers for Rivers and Harbors, accompanied by the reports of the District and Division Engineers, on the Des Moines River at Ottumwa, Iowa, in response to a resolution of the Committee on Public Works of the House of Representatives, United States, adopted 5 October 1966, concerning the advisability of providing additional flood protection for the city of Ottumwa, Iowa, by construction of a pumping plant.
2. The District and Division Engineers recommend Federal construction of improvements to the local flood control project at Ottumwa, Iowa, to increase the discharge efficiency of the city's North Side interceptor sewer and thus reduce flood damage. They find that three gated openings, 54 inches in diameter, in the sewer at locations coinciding with entry of the largest laterals into the interceptor would provide a satisfactory plan at less cost than the pumping plant requested by local interests. They estimate the total cost of the project at \$76,000 for Federal construction and \$100 annually for non-Federal maintenance and operation. Based on an interest rate of 4-7/8 percent, annual benefits and costs are estimated at \$7,400 and \$3,800, respectively, and the benefit-cost ratio is 1.9.
3. The Board of Engineers for Rivers and Harbors concurs in general in the views and recommendations of the reporting officers and concludes that non-Federal construction of a major part of the overall project at a cost of about \$3,200,000 should not preclude Federal participation in the recommended improvements.

4. I concur in the views and recommendations of the Board. Use of the currently prescribed interest rate of 5-1/8 percent in computing annual charges and benefits would result in a benefit-cost ratio of 1.8.

A handwritten signature in dark ink, appearing to read 'F. J. Clarke', with a stylized, cursive script.

F. J. CLARKE
Lieutenant General, USA
Chief of Engineers

ENVIRONMENTAL STATEMENT



DEPARTMENT OF THE ARMY OFFICE OF THE CHIEF OF ENGINEERS WASHINGTON, D.C. 20314

IN REPLY REFER TO

ENG CW-PD

13 November 1970
* Supplemented on
19 February 1971

SUMMARY COORDINATION OF ENVIRONMENTAL STATEMENT ON DES MOINES RIVER AT OTTUMWA, IOWA

1. Coordination of Environmental Statement.

<u>AGENCY</u>	<u>Date of Transmittal</u>	<u>Date of Comments</u>
* Department of the Interior	10 Oct 70	19 Nov 70
* Department of Agriculture	10 Oct 70	13 Nov 70
Department of Transportation	10 Oct 70	26 Oct 70
Department of Health, Education and Welfare	10 Oct 70	12 Nov 70
*State of Iowa	12 Oct 70	1 Dec 70

2. Summary of Agency Comments and Views of the Chief of Engineers:

The correspondence from the interested State and Federal agencies is attached as an inclosure to the environmental statement. The agency comments concerning the environmental aspects of the project are described below.

Department of Transportation.

Comment: The Department states that no comment is made concerning either the draft environmental statement or the environmental impact of the proposed project.

Department of Health, Education, and Welfare.

Comment: Review indicates that the project will have no significant adverse effect on environmental factors of concern to the Department.

Department of the Interior.

Comment: The Department generally concurs with the proposed project recommendations and draft environmental statement.

Department of Agriculture.

Comment: The Department has no comment to make on the draft environmental statement.

State of Iowa.

Comment: The State of Iowa did not make a comment on the draft environmental statement.

2 October 1970

ENVIRONMENTAL STATEMENT

Ottumwa, Iowa, Local Protection

**Review Survey Report for Flood Control
Des Moines River at Ottumwa, Iowa**

Prepared by

**U.S. Army Engineer District, Rock Island
Rock Island, Illinois**

0701 100000 Detailed Five-Point Environmental Statement
for

Flood Control Des Moines River at Ottumwa, Iowa
Prepared in Accordance with Section 102(C) of the
National Environmental Policy Act of 1969
PUBLIC LAW 91-190

1. Project Description. The project involves flood protection for the city of Ottumwa, located on the Des Moines River in Wapello County, Iowa. The proposed project is presently in the preauthorization study stage, and the benefit-cost ratio is 1.9:1.0. The purpose of the project is to prevent flooding of basements in the city's north side main business district when the combined storm and sanitary interceptor sewer system is overtaxed from heavy local runoff. This condition is especially severe during high stages on the Des Moines River. The proposed solution to the problem consists of improving the discharge efficiency of the interceptor sewer by providing additional gated openings in the sewer, to be located upstream from the present outlet at Vine Street, through which flows resulting from heavy rainfall runoff would discharge directly into the Des Moines River.

2. Environmental Setting Without the Project. The area to be affected by the project can be considered as a man-made environment. Human activities throughout the area are generally associated with industrial, commercial, and transportation developments. The area is presently protected from overflow of the Des Moines River by a series of levees and floodwalls built by the city, and by the upstream Federally constructed flood control reservoir project, Red Rock Dam and Lake Red Rock. From an aesthetic and cultural standpoint this area is relatively high quality.

3. Impact Statement.

a. The Environmental Impacts of the Proposed Action. The proposed project will improve the man-made environment by providing protection from interior flooding. The noticable improvement to the environment will be slight since the protection is primarily related only to the sub-structures of commercial buildings.

b. Any Adverse Environmental Effects Which Cannot be Avoided Should the Proposal be Implemented. No adverse effects to the environment or natural resources are expected to result from the implementation of the proposed project.

c. Alternatives to the Proposed Action. Alternatives such as a pumping plant, flood retention reservoirs, and check valves on basement drains were considered either economically infeasible or inadequate for solving the problem. Most of these alternatives would have

an insignificant effect on the environment except the proposal for the flood retention reservoir. This alternative could probably provide a favorable impact on the existing man-made environment.

d. The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity. No short- or long-term losses to the environment are anticipated by the implementation of the proposed project. However, on a long-term basis flood damage reduction can be expected through the protection of the man-made environment.

e. Any Irreversible or Irretrievable Commitment of Resources Which Would be Involved in the Proposed Action Should it be Implemented. It is anticipated that there will not be any irreversible or irretrievable commitment of resources involved in this project.

4. Coordination with Other Agencies. Local interests fully endorse the proposed project. Project plans have been reviewed by the Iowa State Department of Public Health, the Federal Water Quality Administration, and the Bureau of Sport Fisheries and Wildlife, and any recommendations by the above agencies will be considered in our plans to insure that the natural environment will not be adversely affected.

Sincerely,

R. J. Edwards
Rear Admiral, U.S. Coast Guard
Chief, Office of Public and
International Affairs



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDANT (AWL)
U.S. COAST GUARD
WASHINGTON, D.C.
20591

26 October 1970

Colonel J. B. Newman
Corps of Engineers
Executive Director of Civil Works
Department of the Army
Washington, D. C. 20314

Dear Colonel Newman:

This is in response to your letter of 10 October 1970 addressed to Secretary Volpe concerning the draft environmental statement of the flood control project at Ottumwa, Iowa.

This project was previously reviewed and commented on in our letter to the Chief of Engineers dated 24 September 1970. A review of our previous comments was made in light of Section 102(2)(c) of the National Environmental Act of 1969. No additional comments are made concerning the environmental impact of this project upon transportation.

The opportunity afforded this Department to review the draft environmental statement and possibly reconsider our previous position relating to this project is appreciated.

Sincerely,

R. Y. EDWARDS
Rear Admiral, U.S. Coast Guard
Chief, Office of Public and
International Affairs



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

November 12, 1970

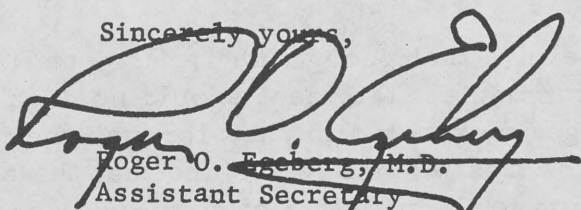
Colonel J. B. Newman, USA
Executive Director of Civil Works
U.S. Corps of Engineers
Department of the Army
Washington, D.C. 20315

Dear Colonel Newman:

As requested in your letter of October 10, 1970, the environmental statement for the Ottumwa, Iowa, flood control project, has been reviewed by appropriate agencies of the Department that have an environmental interest.

Our review of the statement indicates that the project as proposed will have no significant adverse effect on environmental matters of concern to the Department of Health, Education, and Welfare.

Sincerely yours,

A large, stylized handwritten signature in black ink, which appears to read "Roger O. Egeberg".

Roger O. Egeberg, M.D.

Assistant Secretary

for Health and Scientific Affairs



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240



19 November 1970

Dear General Clarke:

This responds to your letter of September 17, 1970, asking for our comments on your proposed report for Des Moines River at Ottumwa, Iowa, and Colonel Newman's letter of October 10, 1970, submitting for our comments the draft environmental statement for the same project.

We have reviewed the proposed report and draft statement and in general concur with your recommendations. We offer the following comments for your information and use.

We find that no recreation development is proposed and that there are no significant opportunities for such development within the scope of the project. However, the proposed plan would permit untreated sewage to be discharged into the Des Moines River during periods of heavy surface runoff, a continuation of the current situation. The Des Moines River at this point has been designated by the State of Iowa for body contact recreation use.

We believe that paragraph 1, Project Description, in the draft environmental statement should be expanded to mention that untreated sewage is expected to pass through the improved sewer at times into the Des Moines River and that the proposed plan is only an interim solution to the problem of combined sanitary and storm sewer overflows.

We appreciate the opportunity of presenting our views.

Sincerely yours,

Deputy Assistant Secretary of the Interior

Lt. Gen. F. J. Clarke
Chief of Engineers
Attn: ENG CW-PD
Department of the Army
Washington, D.C. 20314



DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

November 13 1970

Honorable Stanley R. Resor
Secretary of the Army

Dear Mr. Secretary:

This is in reply to letters from the Office of the Chief of Engineers dated October 10 and 13, 1970. The letters transmitted for our review and comment draft environmental statements for proposed project reports of the Corps of Engineers.

Enclosed are comments of the U. S. Department of Agriculture on draft environmental statements for the following individual projects:

- Alabama-Coosa River System, Selma, Alabama
- Beals Creek at Big Spring, Texas
- Des Moines River, Ottumwa, Iowa
- Ludington Harbor, Michigan
- Missouri River, N. D., S. D., and Nebraska
- Zintel Canyon, Kennewick, Washington

We appreciate the opportunity to review and comment on these statements.

Sincerely,

T. K. COWDEN
Assistant Secretary

Enclosures

November 9, 1970

U. S. DEPARTMENT OF AGRICULTURE COMMENTS

Draft Environmental Statement Prepared by
Corps of Engineers for

Des Moines River, Iowa

The project involves flood protection for the City of Ottumwa, Iowa. The purpose of the project is to prevent flooding of basements in the city's north side main business district when the interceptor sewer is overtaxed from heavy local runoff. The proposed plan would provide additional gated sewer outlets which would discharge directly into the Des Moines River upstream from the present sewer outlet.

We have no pertinent comments to make concerning the statement.



Iowa
a place to grow

Natural Resources Council

Grimes State Office Building
East 14th and Grand
Des Moines, Iowa 50319

OTHIE R. McMURRY, Director
R. G. BULLARD, Water Commissioner

December 1, 1970

F. J. Clarke
Lieutenant General
Chief of Engineers
Department of the Army
Washington, D. C. 20314

Re: ENGCW-PD, Review Survey Report, Des Moines River,
Ottumwa, Iowa

Dear General Clarke:

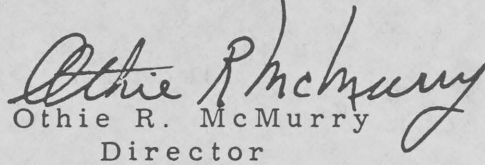
The Iowa Natural Resources Council, acting under the authority provided in Chapter 455A of the Code of Iowa, as amended, and by designation of the Governor of Iowa, submits the following comments for the State of Iowa on the "Review Survey Report For Flood Control, Des Moines River at Ottumwa, Iowa," as submitted to this office September 17, 1970, in accordance with Public Law 78-534 and Public Law 85-624.

These comments are based on the knowledge of the Iowa Natural Resources Council, review of the subject project, discussions with interested State departments and local interests, and a public hearing held at Ottumwa, Iowa, on November 20, 1970. The Iowa Natural Resources Council finds:

- 1) that the City of Ottumwa, Iowa, does experience flooding of basements in the City's north side main business district when an interceptor sewer system is overtaxed from heavy local runoff;
- 2) the condition is severe during high stages on the Des Moines River; and
- 3) the proposed improvement will alleviate the problem and compliment the City's flood protection works.

As a consequence of these findings, the Resources Council concurs in the views expressed in your Report and urges you to submit this project for Congressional action.

FOR THE IOWA NATURAL RESOURCES COUNCIL


Othie R. McMurry
Director

ORM/dhh/jrd

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS



DEPARTMENT OF THE ARMY CORPS OF ENGINEERS BOARD OF ENGINEERS FOR RIVERS AND HARBORS WASHINGTON, D.C. 20315

IN REPLY REFER TO

ENGBR

27 July 1970

SUBJECT: Des Moines River at Ottumwa, Iowa

Chief of Engineers
Department of the Army
Washington, D. C.

1. Authority.--This report is submitted in response to the following resolution adopted 5 October 1966:

Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report on the Des Moines River, printed in House Document Numbered 651, Seventy-eighth Congress, Second Session, and subsequent reports, with the view to determining whether any modification therein should be made at this time with respect to flood control, particularly with reference to the advisability of providing additional flood protection for the City of Ottumwa, Iowa, by construction of a pumping plant.

2. Description.--The Des Moines River rises in southwestern Minnesota and flows southeasterly across Iowa to its confluence with the Mississippi River. The city of Ottumwa, Iowa, is situated on both banks of the Des Moines River, approximately 95 river miles above the mouth, and 50 river miles downstream from Red Rock Dam and Lake Red Rock. The city had a population of 34,000 in 1960. It is served by four railroads, a network of highways, and a commercial airline. Since 1880, the city has operated a hydroelectric dam in the Des Moines River which has a maximum head of 13 feet and an installed capacity of 4,200 horsepower. Navigation on the Des Moines River is limited to recreational boating.

3. Economic development.--Ottumwa has numerous industries, the principal one being the manufacture of farm equipment; others, also related to the agricultural economy of the region, include the manufacture of fertilizer, dairies, and poultry processing. Many smaller enterprises include steel fabrication and the manufacture of castings, tools, millwork, and paper containers. A number of wholesale firms serve Ottumwa as well as a large rural area in southeastern Iowa and northeastern Missouri.

4. Existing improvements.--The Red Rock Dam and Lake Red Rock project was authorized by the Flood Control Act of 1938. The dam, located about 50 miles upstream of Ottumwa, at river mile 142.9 is substantially completed and was placed in operation in 1969. Saylorville Reservoir was authorized by the Flood Control Act of 1958 to supplement the storage capacity of the downstream Red Rock project. The two reservoirs will provide a large degree of flood protection to the lower Des Moines River Valley, including Ottumwa. The Saylorville dam is located at river mile 213.7, upstream from the city of Des Moines. The project is under construction, with completion scheduled for 1974. During the period 1956 to 1964, the city of Ottumwa constructed flood protection works consisting of levees with riprapped slopes, floodwalls, and channel improvements at a cost of about \$3,200,000. However, financing problems forced postponement of the last major item, the Vine Street pumping plant.

5. Floods and damages.--In the past, Ottumwa has suffered severe damage from Des Moines River floods, the most damaging flood being that of June 1947. Since that time, however, the local protection project constructed by the city has provided protection against all but very high flows. When the Red Rock project was placed in operation, the threat of direct flooding from the Des Moines River was practically eliminated.

6. A narrow strip of flood plain and low terrace, about three-quarters of a mile long on the left bank of the Des Moines River, containing the city's main business district, remains subject to flooding. High stages on the Des Moines River substantially reduce the efficiency of the sewer system and heavy local runoff can exceed the discharge capacity of the combined storm and sanitary sewer system. Damage is almost entirely confined to basements of business places and consists of destruction of equipment and goods stored in basements, cost of evacuation of basements, loss of business, and cost of clean-up work. Average annual damages are estimated at \$10,700.

7. Improvements desired.--At a public hearing held by the District Engineer at Ottumwa on 25 June 1968, local interests requested Federal assistance in completing the local protection project essentially constructed by the city in the period 1956-1964.

8. Plan of improvement.--The District Engineer finds the most suitable plan for improving the discharge efficiency of the North Side interceptor sewer to be provision of additional gated openings in the sewer, through which flows resulting from heavy rainfall would discharge directly into the Des Moines River. These openings, 54 inches in diameter, would be cut in the riverward wall of the interceptor at Market, Green, and Jefferson Streets, the locations coinciding with entry of the largest laterals into the interceptor. Gatewells would be built at these points, the openings fitted with sluice gates, and flap valves also would be provided. A pumping plant would relieve the condition causing damage at Ottumwa to some extent. However, the proposed improvements would provide a satisfactory solution of the problem at less cost. In addition, studies indicated that the pumping plant would not be economically justified.

9. Economic evaluation.--The District Engineer estimates the first cost of the proposed improvements at \$76,000, using January 1970 prices. The improvements would be constructed entirely at Federal expense. Average annual benefits from prevention of flood damages are estimated at \$7,400. Annual charges, based on an interest rate of 4-7/8 percent and a 100-year period of analysis, are estimated at \$3,800, including \$100 for non-Federal maintenance and operation. The benefit-cost ratio is 1.9. The District Engineer recommends authorization of improvements in accordance with his plan, subject to certain requirements of local cooperation. The Division Engineer concurs.

10. Public notice.--The Division Engineer issued a public notice stating the recommendations of the reporting officers and affording interested parties an opportunity to present additional information to the Board. Careful consideration has been given to the communications received.

Views and Recommendations of the Board of Engineers for Rivers and Harbors.

11. Views.--The Board of Engineers for Rivers and Harbors concurs in general in the views and recommendations of the reporting officers. The Board notes that the proposed improvements are needed to complete a local flood protection project constructed by local interests at a non-Federal cost of about \$3,200,000, and that these proposed improvements would provide a satisfactory plan at less cost than the pumping plant requested by local interests. It further notes that the proposed improvements would have been provided had the overall project been authorized for Federal construction. Therefore, the Board believes that non-Federal construction of a major part of the overall project should not preclude Federal participation in the improvements recommended by the reporting officers. The Board also notes that the proposed improvements would not increase the amount of sewage bypassed to the Des Moines River and would reduce the health hazards and economic losses created by basement flooding. It is the view of the Board, however, that the proposed improvements should not be considered to be an alternative to adequate waste treatment or a solution to the problem of combined sewer overflows. The proposed improvements are economically justified and the requirements of local cooperation are appropriate.

12. Recommendations.--Accordingly, the Board recommends improvement of the North Side interceptor sewer at Ottumwa, Iowa, in the interest of local flood protection; generally in accordance with the plan of the District Engineer, and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable; at an estimated cost to the United States of \$76,000 for construction: Provided that, prior to construction, local interests furnish assurances satisfactory to the Secretary of the Army that they will:

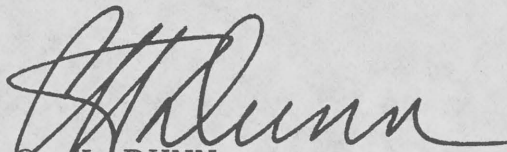
a. Provide without cost to the United States all lands, easements, and rights-of-way, including temporary work areas, necessary for construction of the project;

b. Hold and save the United States free from damages due to construction of the project;

c. Maintain and operate the works after completion in accordance with regulations prescribed by the Secretary of the Army; and

d. At least annually notify persons affected by basement flooding that the project will not provide complete protection.

FOR THE BOARD:

A handwritten signature in dark ink, appearing to read "C. H. Dunn". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

C. H. DUNN

Major General, USA

Chairman

REPORT OF THE DISTRICT ENGINEER

SYLLABUS

The investigation reported on herein concerns the problem of damage caused by flooding of basements of buildings in the main business district of Ottumwa, Iowa. The damage results when the sewer system is overtaxed from heavy local runoff, and is more severe during high stages on the Des Moines River.

The district engineer recommends Federal participation in a plan to reduce the damage to material and equipment in the basements subject to flooding. It consists of improving the discharge efficiency of an interceptor sewer by providing additional gated openings in the sewer. City officials have reviewed and approved the plans. The cost of the work, all to be borne by the Federal Government, is estimated at \$76,000. Average annual benefits are estimated at \$7,400, and annual charges at \$3,837. The benefit-cost ratio is 1.9.



DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

IN REPLY REFER TO

NCRED-PB

10 April 1970

SUBJECT: Review Survey Report for Flood Control - Des Moines
River at Ottumwa, Iowa

Division Engineer, North Central

I - AUTHORITY

1. AUTHORITY

The investigation reported on herein was made pursuant to a resolution adopted 5 October 1966 by the Committee on Public Works of the House of Representatives, which reads as follows:

"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report on the Des Moines River, printed in House Document Numbered 651, Seventy-eighth Congress, Second Session, and subsequent reports, with the view to determining whether any modification therein should be made at this time with respect to flood control, particularly with reference to the advisability of providing additional flood protection for the City of Ottumwa, Iowa, by construction of a pumping plant."

II - EXTENT OF INVESTIGATION

2. The investigation for this report included the following subjects.

a. A survey of damage caused by flooding from runoff trapped behind levees and floodwalls was made.

b. Hydrologic and hydraulic aspects of the specific area of interest and the effect of Des Moines River stages were analyzed. These subjects are treated in detail in appendix A, Hydrology and Hydraulic Design.

c. A field investigation, including consultation with local interests, was conducted to determine particulars of the interior drainage facilities and sanitary sewers in the area of interest. The District Engineer participated in conferring with city officials at the site.

d. Office studies were made of alternative solutions to the flood problem and of estimated costs of improvements.

e. Economic aspects were analyzed. The details of this analysis are given in appendix B.

f. In accordance with Section 105 of Public Law 91-190, the effect of the project on the environment has been considered. A statement relative to this subject is given in appendix D.

III - PRIOR REPORTS

3. HOUSE DOCUMENT 651, 78TH CONGRESS, 2D SESSION

This report cited in the resolution authorizing this investigation outlines, among others, the results of a study for local flood protection at the city of Ottumwa. Justification for such work was considered to be lacking because:

(a) If Red Rock Reservoir, authorized in the Flood Control Act of 28 June 1938, were built, there would be no need for local protective works at that city, and

(b) It was felt that the city would need to solve its problems of separation of sewers and sewage treatment before local protective works would be warranted.

4. SENATE DOCUMENT NO. 9, 85TH CONGRESS, 1ST SESSION

The report in this document is that of an interim investigation of reservoir control on the Des Moines River. Construction of Saylorville Reservoir on the Des Moines River, a short distance upstream from Des Moines, Iowa, was recommended in this report. The problems of any needed local protective works were deferred, pending authorization and construction of reservoirs, for solution in the investigation for a final report.

5. UNPUBLISHED REPORT

A resolution adopted 21 April 1950 by the Committee on Public Works of the House of Representatives, United States, authorized a review of reports on the Des Moines River with special reference to levee protection and channel improvements at Ottumwa. This study was deferred pending completion of a report on flood control reservoirs on the Des Moines River, which report is cited in the immediately preceding paragraph. The reservoir report was referred to the Iowa Natural Resources Council which endorsed, in November 1955, the plans for Saylorville and Red Rock Reservoirs. The Council at that time also expressed the view that local protection projects downstream from large Federal flood control reservoirs should be provided at State or local expense. Accordingly, Ottumwa engaged the services of a consulting engineer,

and plans were developed not only for flood control, but for separation of sewers, sewage treatment, new and expanded water supply and treatment, new bridges, and highway relocation, estimated then at \$15 million. Construction of the plan was begun in 1956, but because of the financial burden this plan imposed, city officials desired Federal aid, and presented its case again to the Iowa Natural Resources Council. The Council, in March 1957, stated that it desired the Corps of Engineers to make an interim study for flood protection at Ottumwa.

6. In consequence of the request by the Iowa Natural Resources Council and the city of Ottumwa, a study was made and the draft of a report was completed and a formal presentation of the plan was made to city officials. The plan in this report provided for completing the parts of the project then unfinished. The city requested deferral of a commitment on this report, stating its intent to complete the project with local funds. In December 1962 the Mayor wrote that the project would be completed early in 1964 and that there would be no need for a Federal project. An unfavorable letter report, subject: "Survey Review of Reports for Flood Control in the Des Moines River at Ottumwa, Iowa," NCRED-R, dated 11 January 1963, responding to the resolution of 21 April 1950, was submitted to the Congress by the Acting Secretary of the Army under date of 21 August 1963.

7. REQUEST UNDER SECTION 205, 1948 FLOOD CONTROL ACT

In May 1963 the Mayor reported that State legislation had been enacted reducing the bonding ability of the city to the point where funds to complete the flood protection project were not available. The main element lacking in the system was the Vine Street pumping plant. In his letter the Mayor requested Federal aid in providing this plant under authority of Section 205 of the 1948 Flood Control Act. It was determined by the Chief of Engineers that inasmuch as a pumping plant was needed to remove drainage blocked because of a locally constructed project, the Corps of Engineers had no authority to provide it. The city was informed of this decision in January 1965.

8. REQUEST FOR REVIEW OF REPORTS

The next and most recent development in the city's effort to obtain Federal aid in completing their flood protection project was the adoption of the resolution giving authority for this investigation.

IV - DESCRIPTION

9. Ottumwa is situated on both banks of the Des Moines River, approximately 95 river miles from its confluence with the Mississippi River. It lies about 50 river miles downstream from Red Rock Dam and Lake Red Rock. The city had a population of 33,631 in 1950 and 33,871 in 1960. It is served by a network of highways, by four railroads, and a commercial airline. Four highway and three railroad bridges cross the Des Moines River within the city limits. Since 1880, the city has operated a hydroelectric dam in the Des Moines River which has a maximum head of 13 feet and an installed capacity of 4,200 horsepower. Navigation on the Des Moines River at this locality is limited to recreational boating.

10. The main business district is located on the left bank, and partly in the flood plain. Most of the population resides on the left bank also. Industrial areas are located on both banks, in most cases in the flood plain.

V - ECONOMIC DEVELOPMENT

11. Ottumwa has numerous industries, chief among which is the manufacture of farm equipment. Many others, also related to the agricultural economy of the region, include the manufacture of fertilizer, dairies, and poultry processing. Many smaller enterprises, not necessarily related to agriculture, include manufacture of castings, steel fabrication, tools, millwork, and paper containers. A number of wholesale firms serve not only Ottumwa, but a large rural area in Iowa and Missouri.

VI - CLIMATOLOGY

12. The U. S. Weather Bureau has maintained precipitation and temperature records at Ottumwa since 1876. The average annual rainfall is about 33 inches, with a maximum of 50.59 and a minimum of 17.33. The mean annual temperature is about 52 degrees, the extremes recorded being 115 and -28 degrees.

VII - RUNOFF AND STREAM FLOW DATA

13. Except for a 5-year period, a gaging station on the Des Moines River at Ottumwa has been maintained since 1917. From October 1930 to March 1935, gage records were kept at a station at Eldon, 10 miles downstream. The maximum observed flow was 135,000 cubic feet per second on 7 June 1947. Minimum mean daily flow was 30 cubic feet per second and the mean flow for the period of record is approximately 4,700 cubic feet per second.

14. With construction of Red Rock Dam and Lake Red Rock essentially completed and placed in operation in 1969, and with completion of Saylorsville Reservoir presently scheduled for 1974, flood flows are expected to be extremely rare events. The drainage area of the basin at Ottumwa is 13,347 square miles. The uncontrolled drainage area between the city and Red Rock Dam is 1,024 square miles, about 7.7 percent of the total. The natural and modified frequency-discharge curves for Ottumwa are included in appendix A. A 15-foot stage, for example, under natural conditions had a frequency of occurrence of once in about 4 years; the modified frequency would be once in about 37 years.

VIII - EXTENT AND CHARACTER OF FLOODED AREA

15. The area for which relief from flooding is desired is the main business district of Ottumwa, a narrow strip of flood plain and low terrace about three-quarters of a mile long on the left bank of the Des Moines River. The threat of direct flooding from the river has been practically eliminated by construction and operation of Red Rock Dam and Lake Red Rock, essentially completed and in operation in 1969. Levees and floodwalls erected by the city in the period 1956 to 1964 afford protection against all but very large flows.

16. A large part of the main business district sustains damage from flooding of basements. This occurs when heavy local runoff exceeds the discharge capacity of the sewer system of that area. Approximately 120 business places are in this area, about 90 of which have basements and sustain damage in varying degree. The river at stages in excess of 10 feet substantially reduces the efficiency of the sewer system. At such times, basement damage is more severe than during lower river stages, local runoff being equal.

IX - FLOOD DAMAGE

17. Basement flooding causes damage in the main business district of Ottumwa. Depending on the intensity of local runoff, the damage will vary from destruction of equipment and goods stored in basements to evacuation of the basements to prevent damage. Damage also takes the form of expenditure of labor, materials, and equipment in cleaning up. Numerous elevators are out of service during such times. In some instances, loss of business occurs. There have been, however, no reports of structural damage to basement floors or walls. Since the sewers that flood the basements carry both storm and sanitary flow, a serious health problem attends the flooding. The method of determining the average annual damage is described in appendix B, Economic Analysis. Average annual damage was estimated at \$10,700.

X - EXISTING CORPS OF ENGINEERS'
FLOOD CONTROL PROJECTS

18. There is no existing Corps of Engineers' flood control project in the immediate area of interest considered in this report.

19. Red Rock Dam and Lake Red Rock, located on the Des Moines River about 50 river miles upstream from Ottumwa, was authorized in the Flood Control Act of 28 June 1938. Construction was begun in 1960, and the project was essentially complete and operating in early 1969.

20. Saylorville Reservoir, located on the Des Moines River at mile 213.7, about 5 miles upstream from Des Moines, Iowa, was authorized in the Flood Control Act of 1958. Construction of the project was begun in 1965, and its completion is scheduled for 1974.

21. Local protective works for the city of Des Moines, Iowa, were authorized in the Flood Control Act of 22 December 1944. Construction was begun in 1966, and parts of the project are complete and operating. The entire project is scheduled for completion in 1972.

XI - IMPROVEMENTS BY OTHER AGENCIES

22. Between 1956 and 1964 the city of Ottumwa constructed a flood protection project entirely at its expense. The features of the project include earth levees, floodwalls, channel improvements, and interior drainage structures. With the exception of a 150-foot gap in the levee, the project, since construction of Red Rock Dam, provides for a very high degree of protection. The cost to local interests was approximately \$3,200,000.

XII - IMPROVEMENT DESIRED

23. A public hearing was held at Ottumwa on 25 June 1968. It was attended by 31 persons, including city officers, businessmen, representatives of railroads, of State agencies including the Iowa Natural Resources Council, of utility companies, and of the news media. Staff personnel of the office of Congressman John Kyl were also present. Oral and written statements were made by owners of several commercial firms on the nature and extent of damage experienced, mainly damage from basement flooding. It was also stated that backing up of the sewer threatens operation of the municipal water plant. The consensus was that the solution to the basement flooding problem lay in the provision of one or more pumping plants. Request was also made that the Federal Government complete the gap in the protective works provided by the city.

24. A late-stage hearing was held on 9 February 1970 at a regular meeting of the Ottumwa City Council. The public was invited to this meeting by announcement through local news media. The meeting was attended by 25 persons. The plan of improvement and its effect toward solution of the problem were presented. General approval of the plan was indicated. A copy of the part of the minutes of the meeting pertaining to the presentation of the plan is included in appendix C. A letter from the Mayor expressing the willingness and ability of the city to cooperate in the proposed improvement is also included in that appendix.

XIII - FLOOD PROBLEM

25. FLOOD PROBLEM

The city initiated construction of local protection works in 1956 and essentially completed them in early 1964 at a cost of some \$3,200,000. Also constructed were intercepting sewers and pumping plants, the cost of which is not included in the above-cited figure. The plan of improvement included levees with riverside riprapped slopes, floodwalls, and channel improvements. The lines of protection are shown on plate 1. Local financing problems forced postponement of construction of the last major items: the Vine Street pumping station, a closure structure at Vine Street, and a short section of the floodwall at Vine Street. Prior to the time when Red Rock Dam and Lake Red Rock were placed in operation, the gap in the floodwall was closed by temporary work which has been removed. The elevation of the riverbank at that location corresponds to a stage of 19 feet. Prior to modification of flows from Lake Red Rock, the frequency of that stage was once in about 20 years. This riverbank now will contain a flood of 200-year frequency with 2 feet of free-board. These relationships may be seen on plates A-1, A-3, and A-4, appendix A.

26. Flooding occurs in the main business district from runoff from heavy local rainfall. This area is served by a 12-foot-wide by 10.5-foot-high concrete box combined interceptor, known as the North Side sewer. During periods when there is little or no rainfall runoff, all flow is conducted to the sewage treatment plant in the downstream part of the city. When there is heavy runoff, the combined flow discharges directly into the river at one point only, at Vine Street, and through a 36-inch sewer to the treatment plant. The runoff is often high enough to result in concentrations on the surface because of insufficient conduit carrying capacity. This condition causes mainly basement flooding. The lowest basement elevation, however, is equivalent to a stage that would result from a flow of some 60,000 cubic feet per second. It is thus seen that in view of modification of flows by Red Rock Dam and Lake Red Rock, direct overflow by the Des Moines River is not part of the problem.

27. Stages that can be expected to occur as often as once in about 7 years as a result of high releases from Lake Red Rock will reduce somewhat the efficiency of the interceptor, since they are high enough to cause a submerged discharge.

28. A second interceptor sewer is the Blake's Branch that discharges into the river a short distance downstream from the North Side sewer outlet. This sewer also carries sanitary flow which is diverted during dry-weather flow periods to the 36-inch line to the treatment plant. A sluice gate can cut off all flow to the treatment plant. Heavy runoff during high river stages often causes surcharge of this sewer and flooding of a street intersection, but aside from this inconvenience it results in little or no damage.

XIV - SOLUTIONS CONSIDERED

29. SOLUTIONS CONSIDERED

The authorizing resolution specifically states that the investigation will include consideration of a pumping plant. A preliminary study showed that a plant having a capacity of 20,000 to 30,000 gallons per minute would be sufficient to pump the design runoff from the affected area. It was concluded that while a pumping plant would give some relief, it would not solve the problem satisfactorily and would cost much more than an alternative plan discussed below. The cost of a pumping plant at this point having a capacity of 25,000 gallons per minute was estimated at \$250,000.

30. As described above, the system of levees and floodwalls is incomplete, a gap of about 150 feet occurring between the upstream side of Vine Street and the downstream side of the Blake's Branch outfall. The original local plan included closing this gap and providing a closure structure at Vine Street. As described above in paragraph 22, there is no need to close this gap, since because of Lake Red Rock, the top of riverbank is above the stage of an extremely infrequent flow. No further consideration, therefore, was given to the matter of providing the structures originally contemplated, but not built.

31. The possibility of retention reservoirs for control of interior drainage for Ottumwa was investigated. Because of the highly developed urbanization in the tributary areas involved, reservoirs to control rainfall runoff are considered not to be a feasible solution to the problem.

32. Because of the minor nature of the inconvenience of street flooding caused at times by surcharging of the Blake's Branch sewer, no further consideration was given to remedial work at that point. This sewer will continue to operate as at present; that is, dry-weather flow will enter the treatment plant, and sanitary flow will enter the river directly when there is high runoff.

33. The use of check valves on basement drains and individual basement protection were considered as non-structural alternatives to the flood problem. However, the previous use of these measures by the individuals involved has proved to be unsatisfactory.

34. A study of the hydrology of the area and the hydraulics of the North Side sewer showed that certain modifications to the sewer would be the most effective and least costly solution to the problem. A plan involving only the present outlet of the North Side interceptor sewer was considered. A gatewell with a large sluice gate would be built at that point, and the four flap gates would be removed. This would increase the discharge efficiency of the sewer. This effect, however, would be obtained at the expense of continuous discharge of raw sewage into the river and continuous overtaxing of the treatment plant.

35. A plan in which additional openings in the North Side interceptor sewer would be made was adopted as a more efficient and more satisfactory solution.

XV - PLAN OF IMPROVEMENT

36. PLAN OF IMPROVEMENT

The plan of improvement consists mainly of providing additional openings in the North Side sewer to relieve the surcharging that often occurs under present conditions. Three 54-inch-diameter openings would be cut in the riverward wall of the sewer, at Market, Green, and Jefferson Streets. The locations were selected to coincide with entry of the largest laterals into the interceptor. The bottoms of the openings would be 3.5 feet above the invert of the sewer, so that raw sanitary flow would not be discharged into the river during periods of low runoff.

37. Gatewells would be built at these points, the openings fitted with sluice gates, and flap valves would be provided. The proposed openings are shown in plan and elevation on plate 2. A typical plan and section of the gatewells are shown on plate 5.

38. The present outlet of the North Side sewer has four cast-iron flap gates, each 4 feet square. To assure positive closure during blocked gravity periods, a gatewell with sluice gate will be built at the present opening. The existing flap gates will remain as they are, and the sluice gate will be on the outside wall, a somewhat unconventional but operable arrangement. This would facilitate pumping from the gatewell with portable pumps in the event of failure of the treatment plant pumps. A plan and section are shown on plate 3.

39. Provision of the three new openings in the North Side interceptor will reduce the head loss by about 2 feet. Maximum gravity flow can be realized up to a 12-foot river stage, whereas under present conditions surcharge of the sewer would occur during the design runoff with stages in excess of 10 feet. The design storm adopted is a 2-year-frequency 30-minute rainfall with a 12-foot river stage. The hydrology and hydraulics of this solution are contained in appendix A.

40. At a 15-foot river stage, all four sluice gates would be closed. All runoff and sanitary flow, then, would be conducted to the sewage treatment plant. The dry-weather flow from all areas in the city is estimated at 8 cubic feet per second, and the pumps at the treatment plant have a capacity of about 40 cubic feet per second. The sewers have the capacity to deliver 40 cubic feet per second to the pumps. The difference between dry-weather flow and the capacity of the system represents a considerable margin of capacity for runoff during periods of gate closure. The rainfall that could reasonably be expected coincident with closure would be of a very low intensity.

XVI - ESTIMATE OF COST

41. COST SUMMARY

The following estimate of cost is based on January 1970 prices. Inasmuch as there is no right-of-way to be furnished and there are no relocations, the entire cost will be borne by the Federal Government.

Drainage facilities	\$66,000
Government costs: (1)	
Engineering and design	6,000
Supervision and administration	4,000
Total first cost	\$76,000

42. DETAILED ESTIMATE OF COST

Description	Quantity	Unit	Unit cost	Amount
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LEVEES AND FLOODWALLS

Drainage facilities

Install gatewell and sluice gate at existing outlet of North Side interceptor sewer				
Rock excavation	8	c.y.	30.00	\$ 240
Compacted backfill	2	c.y.	4.50	9
Concrete	37	c.y.	100.00	3,700
Reinforcing steel	3,700	lb.	0.17	629
10.5'x12' sluice gate w/hoist & trash rack	1	each	20,000	20,000
Cover plate, 2'x5'	1	each	130.00	130
Ladder, 24'	1	each	150.00	150
De-watering	1	job	sum	1,000
Subtotal				\$25,858
Contingencies				5,142
Estimated contract cost				\$31,000

(1) Preauthorization study costs, \$17,000

<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit cost</u>	<u>Amount</u>
<u>LEVEES AND FLOODWALLS</u>				
<u>Drainage facilities</u>				
Jefferson Street, Sta. 19+07				
Install gatewell and sluice gate on existing North Side interceptor sewer				
54" RCP	2	l.f.	50.00	100
Rock excavation	1.6	c.y.	30.00	48
Concrete	18	c.y.	100.00	1,800
Reinforcing steel	1,800	lb.	0.17	306
54" sluice gate w/hoist and assembly	1	each	4000.00	4,000
Cover plate, 2'x5'	1	each	130.00	130
Ladder, 12'	1	each	130.00	130
Flap gate, 54"	1	each	1500.00	1,500
De-watering	1	job	sum	1,000
Cut 5'x5' opening in 18" concrete wall of existing interceptor sewer	1	job	sum	<u>300</u>
Subtotal				\$ 9,314
Contingencies				<u>1,686</u>
Estimated contract cost				\$11,000

Green Street, Sta. 24+10				
Install gatewell and sluice gate on existing North Side interceptor sewer				
54" RCP	2	l.f.	50.00	\$ 100
Rock excavation	1.6	c.y.	30.00	48
Concrete	21	c.y.	100.00	2,100
Reinforcing steel	2,100	lb.	0.17	357
54" sluice gate w/hoist and assembly	1	each	4000.00	4,000
Cover plate, 2'x5'	1	each	130.00	130
Ladder, 16'	1	each	175.00	175
Flap gate, 54"	1	each	1500.00	1,500
De-watering	1	job	sum	1,000
Cut 5'x5' opening in 18" concrete wall of existing interceptor sewer	1	job	sum	<u>300</u>
Subtotal				\$ 9,710
Contingencies				<u>2,290</u>
Estimated contract cost				\$12,000

<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit cost</u>	<u>Amount</u>
<u>LEVEES AND FLOODWALLS</u>				
<u>Drainage facilities</u>				
Market Street, Sta. 28+30				
Install gatewell and sluice gate on existing North Side interceptor sewer				
54" RCP	2	l.f.	50.00	100
Rock excavation	1.6	c.y.	30.00	48
Concrete	21	c.y.	100.00	2,100
Reinforcing steel	2,100	lb.	0.17	357
54" sluice gate				
w/hoist & assembly	1	each	4000.00	4,000
Cover plate, 2'x5'	1	each	130.00	130
Ladder, 16'	1	each	175.00	175
Flap gate, 54"	1	each	1500.00	1,500
De-watering	1	job	sum	1,000
Cut 5'x5' opening in 18" concrete wall of existing interceptor sewer	1	job	sum	<u>300</u>
Subtotal				\$ 9,710
Contingencies				<u>2,290</u>
Estimated contract cost				\$12,000

XVII - ESTIMATE OF ANNUAL CHARGES

43. ESTIMATE OF ANNUAL CHARGES

Computation of annual charges is based on a 100-year project life. Interest and amortization are taken at 4.875 percent. Interest during construction is not charged, since the work could be done in one construction season. The maintenance and operation would be a non-Federal cost.

Estimated first cost	\$76,000
Interest	3,705
Amortization	32
Maintenance and operation	100
Total annual charges	<u>\$ 3,837</u>

XVIII - ESTIMATE OF BENEFITS

44. AVERAGE ANNUAL BENEFITS

The proposed improvement would reduce the damage that occurs under present conditions from flooding of basements in the main business district by increasing the discharge efficiency of the North Side interceptor sewer. Such damage consists of destruction of goods stored in basements, the cost of labor for removing goods and equipment to prevent damage and for clean-up after flooding, and loss of business. The benefits consist of the reduction in average annual damage. Damage which now results from a given storm runoff at a 10-foot stage would not occur until a 12-foot stage were reached. The frequencies of occurrence of those stages are once in about 4 and 7 years, respectively. The duration of the 12-foot stage, however, is much shorter than that of a 10-foot stage, as is planned in the operation of Red Rock Dam. This reduction in duration lowers the probability of occurrence of the design storm coincident with the 12-foot stage. The less frequent occurrence of a damaging river stage and the reduced probability of the design storm during such stage affords a substantial degree of protection. The procedure of determining the damage and benefits is described in appendix B, Economic Analysis. The average annual benefits, based on January 1970 prices and conditions, are estimated at \$7,400.

45. PROJECT FORMULATION

The problem of flooding of basements in this instance does not lend itself to normal formulation procedures. The number of proposed openings in the interceptor was determined using the 12-foot stage as zero-damage elevation. Any openings in addition to the three proposed would not lower the hydraulic gradient in the interceptor sewer. Consideration was also given to providing a pump plant as the solution to the drainage problem. However, an analysis of the hydraulics of the North Side interceptor sewer indicated that a pump plant would be less effective than the proposed plan. A pump plant in addition to the proposed plan would not further reduce the residual damage. As discussed in paragraph 26, the cost of a pumping plant was estimated at \$250,000, considerably higher than the cost of the recommended plan.

46. BENEFIT-COST RATIO

The average annual benefits were estimated at \$7,400. Annual charges were estimated at \$3,837. The benefit-cost ratio is 1.9.

XIX - LOCAL COOPERATION

47. Local interests, the City of Ottumwa, would be required to:

a. Furnish all lands, easements, and rights-of-way, including temporary work areas, necessary for construction of the project;

b. Absolve the United States from damages resulting from the construction and operation of the project;

c. Maintain and operate the project in accordance with regulations prescribed by the Secretary of the Army; and

d. At least annually notify persons affected by basement flooding that the project will not provide complete protection.

XX - COORDINATION WITH OTHER AGENCIES

48. The plan of improvement was developed with the coordination of city officials. A public hearing was held on 9 February 1970 at Ottumwa, at which the improvement as described in this report was presented to local interests. This hearing was held as part of a regular council meeting to which the general public was invited. A copy of the pertinent part of the minutes of the meeting is included in appendix C.

49. A letter from the Mayor of the city states the city's concurrence in the plan and that it is willing and able to comply with the requirements of local cooperation. A copy of the letter is included in appendix C.

50. The views of the Federal Water Pollution Control Administration, the Bureau of Sport Fisheries and Wildlife, and the Iowa Department of Public Health were requested regarding the proposed plan of improvement. Letters from these agencies are also included in appendix C.

XXI - DISCUSSION

51. The investigation reported on herein is limited to the area in Ottumwa, Iowa, subject to flood damage resulting from flooding of basements caused by surcharging of the North Side interceptor sewer and the collector system tributary to it. Such flooding is partially dependent on the stage of the Des Moines River.

52. The resolution authorizing the investigation requested consideration of a pumping plant to relieve the condition causing the damage. It was found that while a pumping plant would give some relief, this solution would be less satisfactory than the proposed solution and would not be economically justifiable.

53. Among other solutions considered, but found unsatisfactory, were storage of runoff by reservoirs, placing check valves on basement drains, and modifying only the present outlet of the North Side interceptor sewer.

54. The solution found most practicable and economical was to increase the discharge efficiency of the North Side interceptor sewer by providing additional openings in the sewer through which flows resulting from heavy rainfall runoff would be discharged directly into the Des Moines River. This solution would lower the frequency of occurrence of damage. Damage which now results with a given runoff at stages in excess of 10 feet would not occur until stages in excess of 12 feet were reached. The frequencies of occurrence of 10- and 12-foot stages are once in about 4 and 7 years, respectively. Further, the duration of the higher stage is much shorter, so that the probability of occurrence of the design storm during the higher stage is considerably lessened. The less frequent occurrence of a damaging river stage and the lowered probability of occurrence of a coincident design storm affords a substantial degree of protection. The proposed improvement would reduce the average annual damage by about 70 percent.

55. The estimated first cost of the proposed improvements is \$76,000. There would be no non-Federal cost, since the work would be done on city-owned property and there are no items of work that are normally considered as a non-Federal charge. The annual charges are estimated at \$3,837. The estimated average annual benefits are \$7,400. The benefit-cost ratio is 1.9.

56. SENATE RESOLUTION 148

Attachment I to this report contains the information required by Senate Resolution 148, Eighty-fifth Congress, 1st session. It includes a discussion of the economic life of the proposed improvement, its cost and benefits, and its justification.

XXII - CONCLUSIONS

57. Damage is sustained by flooding of basements of many buildings in the main business district of Ottumwa, Iowa. Such flooding is due mainly to overtaxing of the sewage collection system during heavy local runoff and partly to high river stages during such runoff periods. It was found that by increasing the discharge efficiency of the North Side interceptor sewer, the average annual damage would be substantially reduced. Local interests are in general concurrence with the plan of improvement.

XXIII - RECOMMENDATION

58. I recommend that the Federal Government participate in improvements to the North Side interceptor sewer at Ottumwa, Iowa, substantially in accordance with the plan described in this report, and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable, at an estimated Federal first cost of \$76,000. I further recommend that Federal participation be made contingent upon receipt from the City of Ottumwa of assurances satisfactory to the Secretary of the Army that they will comply with the following requirements:

a. Provide without cost to the United States all lands, easements, and rights-of-way, including temporary work areas, necessary for construction of the project;

b. Hold and save the United States free from damages due to construction of the project;

c. Maintain and operate the works after completion in accordance with regulations prescribed by the Secretary of the Army; and

d. At least annually notify persons affected by basement flooding that the project will not provide complete protection.

James E. Bunch
JAMES E. BUNCH

Colonel, Corps of Engineers
District Engineer

[First endorsement]

NCDPD-PF(NCRED-PB-10 Apr 70) 1st Ind.

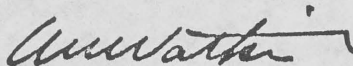
SUBJECT: Review Survey Report for Flood Control - Des Moines River at
Ottumwa, Iowa

DA, North Central Div., CE, Chicago, Ill.

24 April 1970

TO: Chief of Engineers, ATTN: ENGOW-PD

I concur in the conclusion and recommendation of the District Engineer.



W. W. WATKIN, JR.
Brigadier General, USA
Division Engineer

THE UNIVERSITY OF CHICAGO
DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF CHEMISTRY
530 SOUTH EAST ASIAN AVENUE
CHICAGO, ILLINOIS 60607-7070
TEL: (773) 936-5200 FAX: (773) 936-5201
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REVIEW SURVEY REPORT
FOR FLOOD CONTROL
DES MOINES RIVER AT
OTTUMWA, IOWA

APPENDIX C
CORRESPONDENCE

U. S. Army Engineer District, Rock Island
Corps of Engineers
Clock Tower Building
Rock Island, Illinois

EXTRACT

OTTUMWA CITY COUNCIL MINUTES

Regular Meeting No. 5

Feb. 9, 1970

* * *

Meeting with
Corps of Engineers

The meeting was then moved to the basement of City Hall, in order to accommodate a larger group of persons, and to meet with the Corps of Engineers, Rock Island.

Present were:

Colonel James Bunch
Mr. A. F. Burleigh
Mr. Ray G. Stearns
Mr. Barry G. Rought
Mr. A. J. Klingerman

all of the
Corps of
Engineers

Also:

City Council

Ernest Myers

Ronald Neil

Albert Stoessel

Keith Kropf

Martin O'Hara

Charles Chadwick

Del White

H. S. Byrum

Ray Fairbanks

Marcus C. Holland

Henry Cook

Lewis Debo

Ken Sylvester and Representatives of Local #74, John Deere; Local #1, Amalgamated Meat Cutters (Morrell's); and Ottumwa Labor Council.

Councilman Heckart introduced Colonel Bunch, who gave a presentation concerning the "North Side Interceptor Modification," copy of which is hereby made a part of these minutes. Afterward, there was an open discussion, with questions and answers. It was stated that because of Red Rock, the situation in Ottumwa was greatly improved; with the modification as proposed by the Corps of Engineers, Ottumwa would have greater protection up to a flood height of 12 ft. or more.

EXTRACT

OTTUMWA CITY COUNCIL MINUTES

Regular Meeting No. 5

Feb. 9, 1970

(continued)

Councilman Heckart thanked Colonel Bunch and expressed the appreciation of the City Council for the study and the hours of work entailed. It was felt that the improvements as suggested by the Corps of Engineers, would mean a great improvement for the City of Ottumwa and at no cost to the City.

Suggested reply by local interests in connection with local flood protection projects.

OTTUMWA, IOWA
FEBRUARY 17, 1970

Colonel James E. Bunch, District Engineer
U. S. Army Engineer District, Rock Island
Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Bunch:

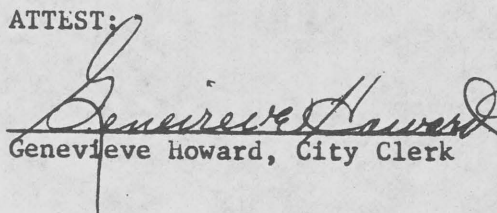
The general plan of improvement at Ottumwa, Iowa,
for protection against Des Moines River floods has been
reviewed and found to be generally acceptable. The items of
local cooperation have also been reviewed. It is understood
that both the plan and items of local cooperation are prelim-
inary and subject to change.

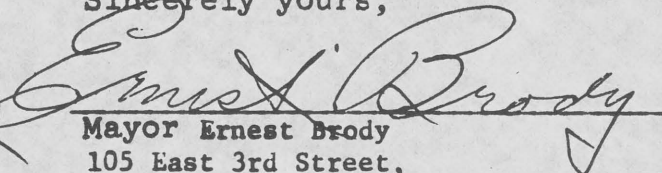
The city has the ability to cooperate with the Federal
Government and would be willing to do so.

We will be pleased to consider the matter further after
the project has been authorized by Congress, at which time the
formal assurances of local cooperation are to be furnished.

Sincerely yours,

ATTEST:


Genevieve Howard, City Clerk


Mayor Ernest Brody
105 East 3rd Street,
c/o Municipal Bldg.,
Ottumwa, Iowa 52501



United States Department of the Interior

FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

IN REPLY REFER TO:

Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

RB

February 26, 1970

Colonel James E. Bunch
District Engineer
U. S. Army Engineer District
Rock Island
Clock Tower Building
Rock Island, Illinois

61202

Dear Colonel Bunch:

This is in reply to your letter of February 5, 1970, File NCRED-PB, requesting our comments on a plan of improvement for local flood control on the Des Moines River at Ottumwa, Iowa. This project features the addition of three 54-inch sewer (storm) openings and one sluice and gatewell in the Vine Street area of the City.

According to our review, neither the fish nor the wildlife resources will be adversely affected by the project. Further, the project does not offer feasible opportunities for enhancement of these resources.

If there is a major change in the project plan, please advise so that we may update and modify our report if necessary.

Sincerely,

S. E. Jorgensen
Assistant Regional Director



UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION
33 EAST CONGRESS PARKWAY, ROOM 410
CHICAGO, ILLINOIS 60605

May 25, 1970

Mr. F. W. Ashton, Acting District Engineer
U. S. Army Engineer District, Rock Island
Clock Tower Building
Rock Island, Illinois 61201

Dear Mr. Ashton:

We have reviewed the descriptive material and drawings for the review survey report on "Flood Control - Des Moines River at Ottumwa, Iowa," which was submitted by your office. We wish to offer the following comments:

1. The water uses listed in the State Water Quality Standards for the Des Moines River at Ottumwa, Iowa, are a) public water supply, b) aquatic life-warm water area, and c) whole body contact recreation.
2. Some relevant requirements of the State Water Quality Standards include freedom from substances attributable to municipal, industrial, or other discharges that cause sludge deposits, floating debris, oil, scum, color, odor, or substances otherwise detrimental to legitimate water uses. Also at the point of withdrawal for public water supplies and for whole body contact recreation, the water should be free of the presence or probability of the presence of sewage or other objectionable bacteria bearing wastes. For aquatic life in warm water areas the dissolved oxygen (DO) should not be less than 5.0 mg/l during at least 16 hours of any 24-hour period and not less than 4.0 mg/l at any time. The State Standards also specify that the minimum weekly flow which occurs once in ten years shall be used as the design parameter to determine the degree of treatment necessary to protect the specific water use.
3. The waste treatment plant at Ottumwa serves a population of 35,000 but treats a waste of about 560,000 population equivalents. The difference of about 525,000 population equivalents is attributed to discharge of industrial wastes to the sewer system. Industries in Ottumwa include the John Deere Ottumwa Works with over 1,000 employees, the John Morrell Company which produces meat products and has over 1,000 employees, and several smaller companies that produce meat and milk products. Combined sewer overflows from this sewer system may therefore contribute a large pollutional load to the Des Moines River.
4. The policy of the Iowa Water Pollution Control Commission on combined sewer systems is contained in the following statement from the Iowa "Water Quality Criteria and Plan for Implementation and

Enforcement": "It has been the policy of the State Department of Health since 1930 not to approve combined sewer systems and has recommended a program of complete separation of sanitary and storm sewers. Under the Iowa Water Pollution Law, the overflow from the combined sewers is pollution and the Water Pollution Control Commission has taken the position of recommending the separation of the systems. It is recognized that separation is a long and costly project since the combined systems are located in the older and larger cities where development has increased their replacement costs. A majority of the cities have accepted recommendations to initiate a sewer separation program on a schedule spaced over a period of time."

It is also the policy of the Federal Water Pollution Control Administration that combined sewer overflows are a large source of pollution and should be prohibited or corrected.

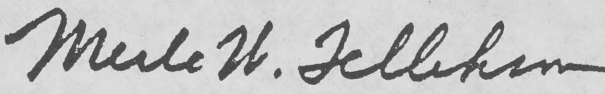
5. Since the present combined sewer overflows would occur without the proposed structures and would cause basement flooding, the use of the proposed structures to eliminate flooding would not add to the problem of pollution from combined sewer overflows. However, the overflow structures should be considered an interim measure to relieve present flooding pending a solution to the problem of combined sewer overflows.

6. The proposed overflow structures, which will have both flap gates and sluice gates, should be operated so that the maximum amount of combined sewer flows are diverted to the waste treatment plant.

7. The elimination of basement and street flooding from combined sewer overflows will have significant public health benefits.

We appreciate the opportunity to comment on the water quality features of this project.

Sincerely yours,

for 
Carlisle Pemberton, Jr.
Director, Office of
Technical Programs

Iowa
State Department of Health

LUCAS STATE OFFICE BUILDING
DES MOINES, IOWA 50319

ARNOLD M. REEVE, M.D., M.P.H.
COMMISSIONER OF PUBLIC HEALTH

Environmental Engineering Service

P. J. Houser, M.S., P.E., Chief

7 July 1970

Col. James E. Bunch
District Engineer
Rock Island District,
Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

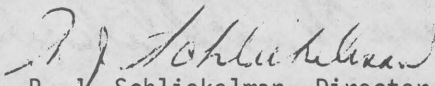
RE: REVIEW SURVEY REPORT, FLOOD CONTROL,
DES MOINES RIVER AT OTTUMWA

Ref: NCRED-PB

This in reply to a letter dated March 13, 1970 requesting comments of this Department on the above referenced project.

The improvements consist primarily of additional openings in the existing North Side Interceptor Sewer to relieve surcharging of the sewer and basement flooding occurring under present conditions. The bottoms of the openings at the 3.5 foot elevation above the invert of the sewer will prevent discharge of raw sanitary sewage to the river at normal sewer flows which would be conducted to the sewage treatment plant.

The plan of improvement will not increase the amount of sewage bypassed to the river and will reduce the health hazards and economic losses created by basement flooding in the sewers connected to the interceptor sewer. This Department, therefore, is in agreement with the proposed project.


R. J. Schliekelman, Director
Water Pollution Division

RJS/ab

CC: Regional Health Service No. 5, S.D.H.

REVIEW SURVEY REPORT
FOR FLOOD CONTROL
DES MOINES RIVER AT
OTTUMWA, IOWA

ATTACHMENT I

Information called for by Senate Resolution 148,
Eighty-fifth Congress, 1st Session
adopted 28 January 1958

1. DESCRIPTION

The proposed improvement would reduce the average annual damage that occurs from flooding of basements in the main business district of Ottumwa, Iowa. It consists of increasing the efficiency of an interceptor sewer by installing additional gated openings. The project would reduce the frequency of flood events and reduce the probability of occurrence of those events. Average annual damage would be reduced by about 70 percent.

2. FIRST COST

The first cost of the improvement is estimated at \$76,000. There would be no non-Federal cost, since the work would be done on city property, and there would be no items normally considered to be chargeable as a local responsibility.

3. ANNUAL CHARGES

The annual charges are \$3,837, consisting of interest and amortization on the estimated first cost, computed on the basis of a 100-year project life at a rate of 4.875 percent, and maintenance and operation costs of \$100.

4. ANNUAL BENEFITS AND BENEFIT-COST RATIO

The annual benefits consist of the reduction in average annual damage and are estimated at \$7,400. The benefit-cost ratio is 1.9. Amortization of the costs over a shorter period, say 50 years, would not materially affect the economic feasibility of the improvement.

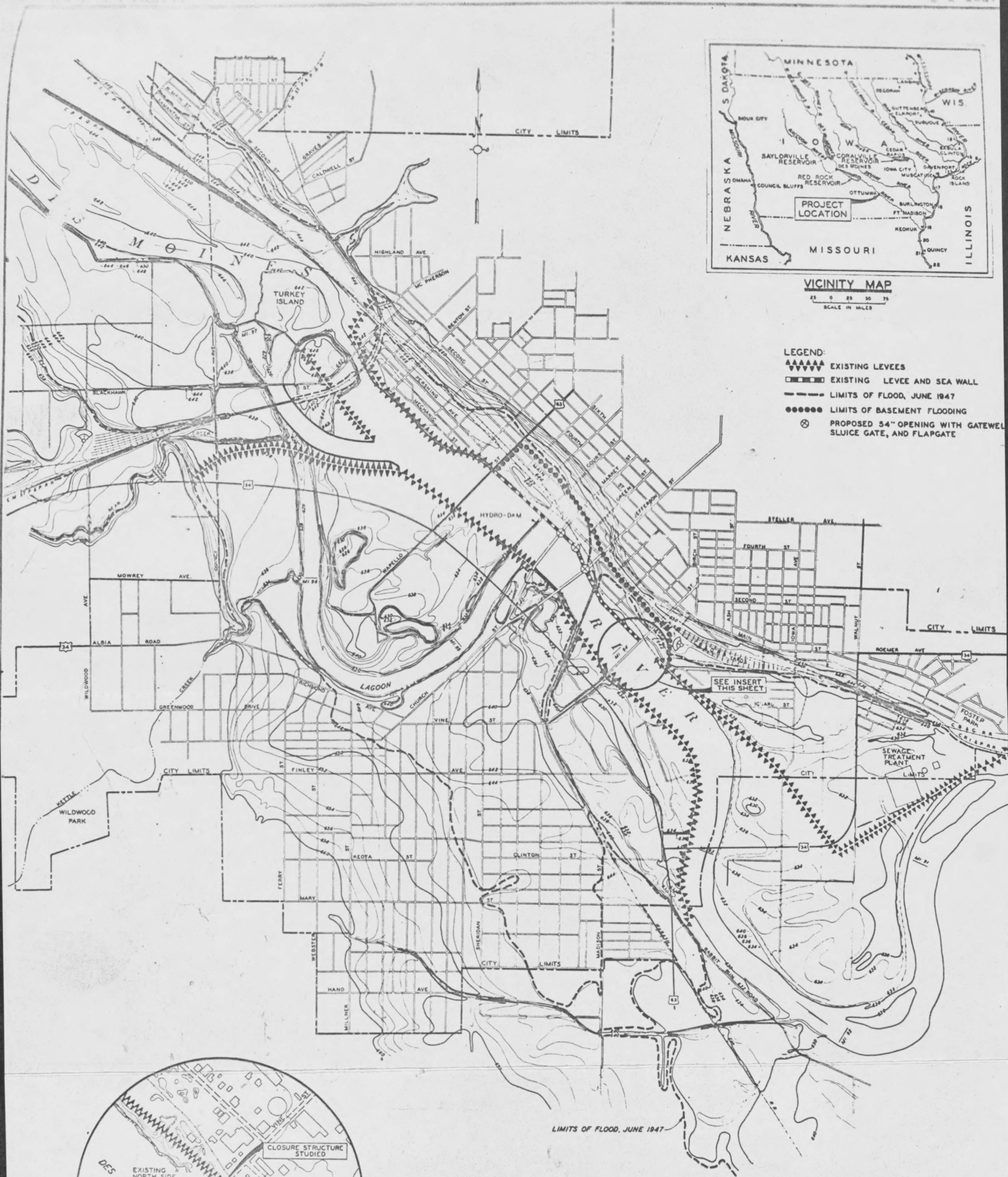
5. APPORTIONMENT OF COSTS

The requirements of local cooperation would be those prescribed in the Flood Control Act of 1936 and subsequent acts. These consist of furnishing without cost to the United States all lands, easements, and rights-of-way, including work areas necessary for construction of the project, absolving the United States from damages due to the construction works, and maintaining and operating the project. Officials of the city government have indicated their willingness and ability to comply with these requirements.

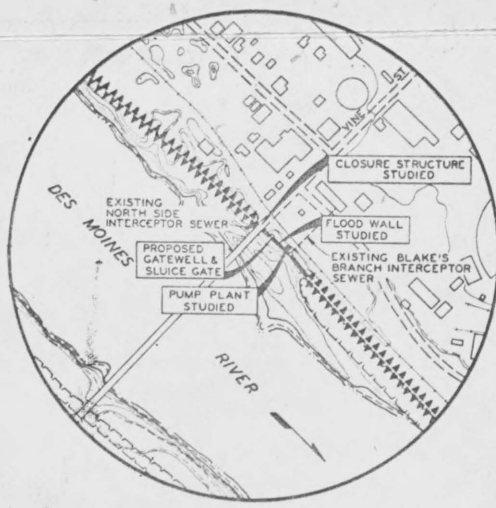
6. DISCUSSION

In developing a plan of improvement, numerous alternative solutions were considered. These included a pumping plant, reservoir storage, and check valves on basement drains. None of these was found to be practicable or economically justifiable. Closing a gap in the local protective works provided by the city was found to be unnecessary, since the riverbank at that location is above a stage of very infrequent occurrence. This is because of operation of Red Rock Dam and Lake Red Rock, about 50 miles upstream. A minor flooding problem involving the Blakes Branch interceptor sewer was found not feasible to correct.

7. The adopted plan, of increasing the discharge efficiency of the North Side interceptor sewer by providing three additional openings, was the only plan found feasible and satisfactory. The nature of this proposed improvement is considered not susceptible of normal formulation procedures.



- LEGEND:**
- ▲▲▲▲▲ EXISTING LEVEES
 - ▬ EXISTING LEVEE AND SEA WALL
 - - - - - LIMITS OF FLOOD, JUNE 1947
 - LIMITS OF BASEMENT FLOODING
 - ⊗ PROPOSED 54" OPENING WITH GATEWELL SLUICE GATE, AND FLAPGATE



**DES MOINES RIVER, IOWA
OTTUMWA, IOWA
LOCAL FLOOD PROTECTION
GENERAL PLAN**

SCALE IN FEET
0 500 1000 2000 3000

ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

SUBMITTED: [Signature]
CHIEF PLANNING DIV.

RECOMMENDED: [Signature]
CHIEF ENGINEERING DIVISION

APPROVED: [Signature]
DISTRICT ENGINEER
ROCK ISLAND DISTRICT

DRAWN BY: [Signature]
TRANSMITTED WITH REPORT

